

Estrangement on the Launch Pad

*DOD loses affection for the space shuttle
and takes up with an old flame*

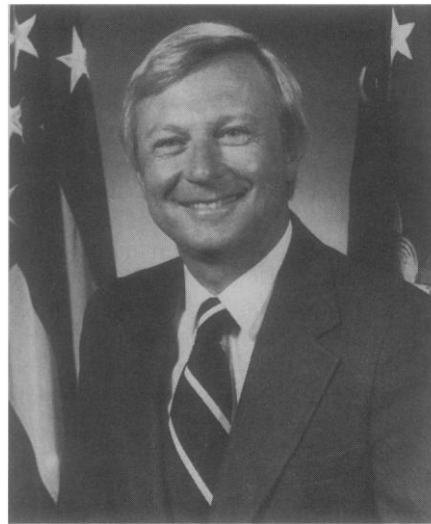
When Congress first approved the space shuttle, it did so on the government's advice that existing rockets were an absurdly extravagant means of transporting military and civilian satellites into orbit. Buy a manned reusable ferry, said officials at the Defense Department (DOD) and the National Aeronautics and Space Administration (NASA), and costly, expendable rockets will be forsworn. Satisfied, the Congress plunked down billions of dollars so that the shuttle could meet any foreseeable need.

Now, however, one of the principal partners in the venture is preparing to jump spaceship, only 3 years after the shuttle's first flight. Having decided that the spacecraft is simply incapable of living up to its billing as a flexible, reliable, and cheap transportation system, the Department of Defense has proposed—amazingly enough—to launch some satellites originally intended for the shuttle on a series of new expendable rockets. Although the exact specifications have not yet been determined, the lifting power and payload capacity of each rocket will be comparable to that of the shuttle, but the cost of each launch has been forecast as somewhat less.

Not surprisingly, the proposal has generated considerable anger and anxiety at NASA. The anger stems from a conviction that after finally emerging from a long and difficult development period, the shuttle presently deserves more, not less, Defense Department support. "The space shuttle is the most reliable space transportation system ever built," NASA administrator James M. Beggs has told allies in Capitol Hill. "I believe the current fleet can meet all presently projected foreign and commercial, DOD, and NASA requirements for years to come." For months, space shuttle enthusiasts, including Representative Don Fuqua (D-Fla.), chairman of the House Science and Technology Committee, have been lobbying vigorously to kill the Pentagon proposal.

Anxiety at NASA stems largely from recognition that the proposal is likely to win approval anyway. As powerful as NASA's allies are, the Pentagon's are even more powerful. The agency's fear is that a small withdrawal of payloads from the shuttle to expendable rockets

could easily expand to a substantial migration. The difficulty is that every time a payload is removed from the shuttle manifest, the actual cost of ferrying the remaining payloads increases. Already facing serious competition from the European Space Agency's Ariane program, NASA may thus face the disagreeable choice of increasing its rates and pricing itself out of the commercial market, or making up the loss with funds from other space programs. "Am I worried about this possibility?" says Chester Lee, the director of space shuttle customer services. "You bet I am."



Edward C. Aldridge, Jr.

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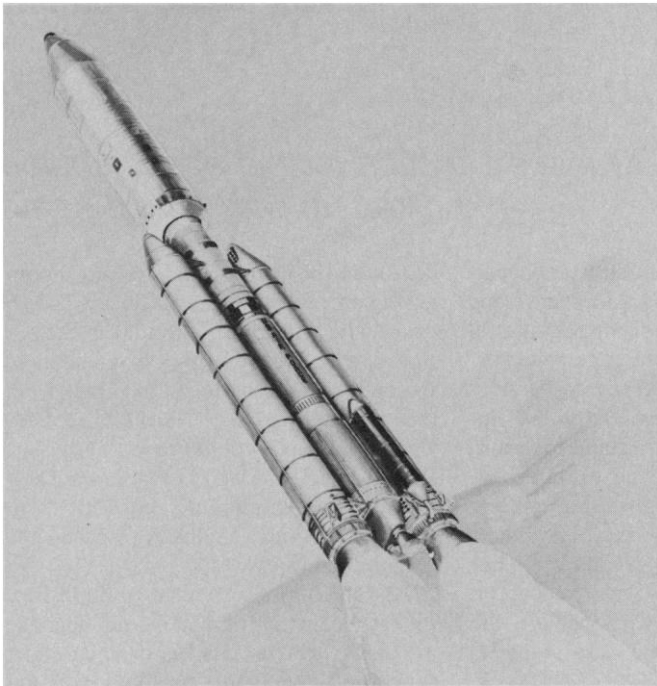
Although Pentagon officials claim that they will remove no more than 10 satellites from the shuttle manifest, hardly anyone in Washington believes them. One reason is that more than 10 rockets will be produced. Another is that the primary candidates for rocket launching are communications and early warning satellites that come in constellations of 3, 6, and 7. Other payloads are also under consideration, and the Air Force is apparently having a tough time deciding among them. A third reason is that the Pentagon wants to start using the rockets in 1988, when the price of sending payloads on the shuttle could jump sharply, from roughly \$30 million to as much as \$100 million per flight, as existing NASA subsidies are phased out.

Taking this into consideration, a congressman recently asked Edward C. Aldridge, Jr., the under secretary of the Air Force, whether the Pentagon would have the option of removing all payloads from the shuttle in 1988. Aldridge replied, "That option would exist, yes sir. Whether or not we would exercise it would depend upon the cost to us to modify additional payloads to go on the [expendable rocket]."

To NASA, the proposal to build new rockets seems particularly cruel because the agency has exerted enormous effort to win the Pentagon's business over the last decade. During its early development, the shuttle's shape was altered so that it could traverse the distance demanded by military requirements; the payload bay was expanded to hold unwieldy intelligence satellites; and state of the art engines were designed specifically to lift weighty military payloads. Roughly a billion dollars is presently being expended on shuttle weight reductions and engine improvements so that these goals will be met.

In exchange for these commitments, NASA won a pledge in the late 1970's that the Pentagon would itself contribute more than \$15 billion to the shuttle program and allow it to become the exclusive transportation system for military payloads. This pledge was reiterated by Pentagon officials at several congressional hearings and codified in the National Space Policy, a document signed by President Reagan in 1982. "Expendable launch vehicle operations shall be continued by the United States government *until* the capabilities of the [shuttle] are sufficient to meet [Pentagon] needs and obligations," the policy states (emphasis added).

Although NASA fervently believes this bargain can be met by 1988, the Pentagon strongly disagrees, on two principal grounds. One claim is simply that the program's terrible track record casts grave doubt on NASA's assurances. "We're looking at essentially a change in the conditions under which we signed up to that original agreement," says Aldridge, an aeronautical engineer. NASA has thus far failed to launch most of its missions on time; it has vastly exceeded cost projections; and it has



This drawing depicts Martin-Marietta's entry in the competition to build a new expendable rocket for the Air Force. A variation on the existing Titan 34D, the rocket will use engines that were originally designed in 1969.

failed to provide a flexible choice of 5 shuttle orbiters (NASA and the Pentagon agree that only two will be capable of transporting the heaviest military payloads to geosynchronous orbit).

"All of these are new factors that really only came to light in the last year or two," Aldridge says. "If things worked perfectly, which they do not . . . could we do with the shuttle? Absolutely. . . . The question is, do we want to depend on things working perfectly for the future? . . . Right now, we do not have a reliable, responsive launch capability for the future."

Specifically, the Air Force says it expected that each shuttle could be reflown within 7 days, that military payloads could be quickly and easily loaded on board, and that total launch costs would be one-third those of an expendable rocket. Instead, the minimum shuttle turnaround time will probably be 40 days, "payload integration is more time consuming and technically difficult than originally thought," missions have to be scheduled far in advance, and launch costs are equal to or greater than comparable rockets. A space policy document approved by Defense Secretary Caspar Weinberger in February concludes that, as a result, total reliance on the shuttle "represents an unacceptable national security risk," and unmanned, expendable rockets—which "offer a high degree of requirements satisfaction, low technical risk, and reasonable schedule availability"—are needed to satisfy DOD needs.

"I'm sorry, I can't accept that," responds Chester Lee at NASA. "They watched as the program was cut to four

vehicles, and they were onboard throughout that period. They don't need a 7-day turnaround time—7 days for what, you ask them. Frankly, they couldn't get their own payloads ready for launch that quickly. We're making damn good progress getting the turnaround down to 28 days. How can they predict it will be 40 days? We work in this business and we know what we're doing. As to the cost, it's true, we told them in an official letter that it could go as high as \$100 million. But we might bill only for launch materials and services, which would be roughly half that amount."

Back at the Pentagon, however, another, more worrisome complaint arises. The shuttle is simply unsafe, various officials suggest. Minor mishaps are predictable, catastrophic accidents are likely, and the entire fleet could be grounded at any time. "What if it lands sideways? What if the auxiliary power units catch fire as it comes in?" speculates Colonel William Barlow, an aide to under secretary Aldridge. "What if it crashed on launch? What if there was a major problem with the engines? What if it was sabotaged?" adds Dennis Granato, an aide to the Pentagon's top scientist. This fear is buttressed, the Air Force says, by a 1982 RAND Corporation study, which flatly predicts that between one and three of the billion-dollar shuttle orbiters will be lost to accident during the lifetime of the program.*

Additional evidence along these lines is supplied by the congressional testimo-

*A spokesman for the RAND Corporation cautions that this was only a preliminary analysis based on highly conjectural statistics.

ny of Willis Hawkins, who recently chaired NASA's Aerospace Safety Advisory Board. "One of these days," Hawkins told the House Science and Technology Committee in April, "we're going to lay up a shuttle for a substantial amount of time." He complained in particular that the shuttle's "rotating machinery, the hydrogen and oxygen pumps are very, very marginal;" that "the shuttle landing gear comes up to its design load almost every landing . . . I think there's just not enough margin there;" that "a lot of the parts and pieces on the shuttle could stand some reassessment;" that the shuttle's auxiliary power units, needed for steering in ascent and reentry, are susceptible to fuel leaks and early breakdowns; and that NASA still tests and certifies shuttle components haphazardly.

NASA responds by discounting the enduring significance of these problems and by insisting that DOD needs can be accommodated even if a shuttle vehicle is lost. "We feel we can support them anyway, with a minimum of inconvenience," Lee says. "They have launch priority. Besides, if they're so concerned about it, why don't they support the construction of a fifth orbiter?" Because, Pentagon officials curtly say, that would simply be more of the same.

Under DOD's initial plan, the new expendable rockets were to be purchased under a highly unusual arrangement whereby the Air Force could put off any payment until the construction was complete, at which point all contractor costs would be reimbursed. In so doing, the program could have bypassed congressional appropriations committees until 1988. In May, however, the plan was withdrawn at the direction of the Office of Management and Budget, which stepped in at NASA's request. "The idea hadn't gone through channels," a senior Administration official explains. "The funding plan was clearly unorthodox and potentially a management disaster."

But a new, more straightforward financing plan is now being formulated, and White House sources predict that this time the idea will win the necessary sanctions. Already two aerospace firms, Martin Marietta and General Dynamics, have submitted bids for the work. Even NASA sees that the die is cast. Recently, the agency has publicly suggested that if the Pentagon insists on building a new rocket, it do so with shuttle-derived hardware. This would help cut shuttle development and launch costs and provide a bridge to the agency's much-desired "heavy-lift vehicle"—an un-

manned cargo ship for space station materials and equipment, as well as manned planetary exploration, and the construction of a base on the moon.

The Pentagon, however, is resisting NASA's compromise, partly out of skepticism that the shuttle-derived vehicle will be ready by 1988, and partly out of a simple desire to control the program by itself. Several months ago, the House and Senate appropriations committees requested an assessment of the competing proposals by the National Academy of Sciences. The study, to be chaired by Robert Fossum, a former director of the Defense Advanced Research Projects Agency who is now dean of the school of engineering and applied science at Southern Methodist University, will be completed by 1 September.

Whichever rocket is built, the shuttle is in for some rough competition. Although intended primarily for the heaviest military payloads, the new rocket may also be capable of cheaply hoisting both lightweight and heavy commercial payloads. Separately, the Air Force is studying a plan to refurbish 56 old Titan II missiles for use with lightweight military payloads. And \$2.8 million in the Air Force budget is allocated to preliminary design of a manned spaceplane, similar to the shuttle but capable of lifting off from a conventional airfield on short notice and circling the globe in 90 minutes.

NASA officials are justifiably concerned that the potential withdrawal of the shuttle's single biggest customer will convey a strong, worrisome message to its commercial clients. Yet they can hardly deny that the shuttle has thus far failed to live up to its promise. "Somebody made a big mistake long ago," says the senior Reagan Administration official.

The ironies were noted by Representative Kenneth MacKay, a first-term Democratic congressman from Gainesville, Florida, during Aldridge's recent congressional testimony. "We have put the rest of the space research program back a decade trying to get the shuttle in gear, and find that the military basically sees good reasons why the shuttle [is] not a crucial thing. . . . Maybe this is the first time we have [had] . . . a realistic assessment of the shuttle system. Maybe we've designed a dinosaur. What will it be used for if you and the other commercial users decide that we're going to go to expendables? What will it be used for except an occasional recovery of something . . . for the Smithsonian?" Twenty billion dollars later, these are all good questions.—**R. JEFFREY SMITH**

Do Seminars Leak Navy Secrets?

In a memo that stung senior scientists working for the Navy, Vice Admiral R. A. Miller, vice chief of naval material, recently wrote that the government "does not want Navy Material Command personnel actively participating in non-Department of Defense sponsored symposia, conferences, or other similar forums on weapons and associated technologies related subjects." Taken literally, the memo seems to ban the discussion of weapons in almost any professional or educational setting. But it specifically targeted "commercially sponsored" seminars. There is some confusion as to how broadly it should be read.

The warning, issued on 2 April, inflames a sore subject at the Pentagon, the difference over how to manage sensitive but unclassified military information. As one Navy official says, it is a dispute between adherents of two approaches—"security by blockage and security by accomplishment." Some, including Admiral Miller, would have the military err, if it must err, on the side of secrecy.

The other approach assumes that the benefits of communicating with the outside world outweigh the risks. In a broad interpretation, this means employees should be allowed not only to give talks to professional societies, but even to moonlight as instructors at special seminars. The argument for the open approach is that the military gains more by sharing its expertise than by hoarding it. "The [electronics] community isn't going to miss us if we withdraw," says one official. "We're going to miss the community."

In this memo, Miller singled out four Navy civilian employees by name for unfavorable mention. All are leaders in their fields. They are Merrill Skolnik, superintendent of the radar division at the Naval Research Laboratory (NRL) in Washington and author of two classic texts on radar; Robert Hill, director of advanced radar systems in the Naval Sea Systems Command and a leader of many international conferences on radar; Stephen Mango, a NRL physicist involved in radio astronomy and remote sensing; and Richard Hu, a senior systems analyst in the AEGIS (shipboard missile) program office and a 25-year veteran in defense R&D. All were instructors in radar courses given at the George Washington University (GWU) program of continuing education in Washington, DC.

Miller saw these courses as confirming his view that there is "too much open source publication and discussion of information on our weapon systems. . . ." Miller wrote that these "are another example of the type of thing that contributes to the undesirable availability of sensitive information on Navy programs and capabilities."

Miller did not clarify the memo before *Science* press time. "The Admiral will not be available," said his assistant, Lieutenant Commander Bradford Goforth.

Meanwhile, the four Navy scientists have responded in different ways. All are stewing quietly, and Hill has resigned from the university faculty. He says that in the 10 years he has taught the course on radar fundamentals, there has "absolutely not" been any discussion of classified or sensitive data. He had no inkling that he would be cited as an example of an information leaker and is offended.

Hill is proud of his skill as a teacher: "One person told me that in a couple of hours I made him really understand how an antenna forms a beam—better than he had understood it in a year or more of studying at college." Teaching, he says, is "a great moral compulsion, a good thing to do. . . . I really thought that on balance, I was contributing to the increased strength of our security." Others mentioned in the memo are still teaching. One is said to be considering taking legal action if he is told to stop.

J. W. Perkins, director of GWU's continuing engineering education program, says: "This university would mutiny if we did teach anything classified." He advises all instructors—many of whom have security clearances—to be particularly guarded in what they say during informal question-and-answer sessions. With 570 courses in the catalog and 850 instructors, Perkins thinks a ban on military participation would be felt more sharply by the military than by the school.—**ELIOT MARSHALL**